Botanical Gazette.

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Editorial.—THE GENUS SENECIO contains more than 1,000 species, but still new ones are being described.

ON PAGE 224 in the last GAZETTE it is stated that *Yucca macrocarpa*, Engelmann, has seeds "rugose-runcinated." Of course the manuscript shows "rugose ruminated."

MR. W. W. BAILEY has been appointed Professor of Natural History (Botany) and Curator of the Herbaria at Brown University, to meet the requirements of S. T. Olney's will. It is a well deserved appointment and one very gratifying to Prof. Bailey's friends.

DR. GRAY is back in England again from his trip on the Continent, with headquarters, as formerly, at Kew.

A LATE COPY of *Nature* announces the death of Dr. Ludwig Rabenhorst of Meissen (Saxony). He was a well known botanist and editor of the *Hedwigia*.

MR. JOHN SANDERSON of Natal has just died. He was an indefatigable explorer of the South African flora and in his honor was named the genus *Sandersonia*.

PROFESSOR P. F. REINSCH has for some time been studying with the microscope sections of coal. Having made his sections in a peculiar and difficult way he has obtained 1,200 perfect ones, and with these he upsets all our previous notions in regard to the nature of coal. The Professor does not expect us to accept his views, for we are creatures of habit, but he does expect us to help observe and "carry the light of science into this dark field of hereditary beliefs." The central ideas are as follows: The organic forms of the coal are Protophytes, that is, "plants without distinct cell structure, with sporadic enclosures of spores and tissue fragments of cryptogamous and still higher plants." Prof. Reinsch groups these forms into seven generic types, and fifty-two specific forms are described and figured. The well known rapidity with which such low forms under favorable conditions propagate would seem to account easily for the enormous accumulation of the vegetable material of our coal measures. The different kinds of coal might also be explained by the prevailing protophytes of the stratum. In the last *American Naturalist* George A. Koenig gives a good review of this work of Prof. Reinsch.

DR. ALEXANDER DICKSON in the last *Journal of Botany* considers, with the help of two plates, the morphology of the pitcher of *Cepha-*

lotus follicularis. With regard to the morphology of the parts of the leaf of *Nepenthes*, he comes to the conclusion that in this well known genus "we have to deal with a leaf the lamina of which is interrupted in the middle of its course by becoming reduced to its midrib, and that while the proximal portion of the lamina retains its typical form of a flat expansion, the distal portion becomes peltately expanded into a funnel or pitcher."

As WE ARE going to press Dr. Farlow's monograph on New England Algæ comes to hand. As it is so late in the season he distributes them without binding. As soon as copies can be bound they will be on sale at the Naturalist's Bureau, Salem, Mass. An artificial key makes it of use even to those who have no intimate knowledge of the structure of Algæ. Every person on the sea shore this summer, who is at all scientifically inclined, should have a copy of this monograph.

Home and Foreign Modes of Teaching Botany. III. – Though somewhat out of the usual order for a botanical journal to discuss modes of teaching, I offer the following, on the simple ground that the time appears to be ripe for it. Until within the last ten years botany in the United States has been with the many students and with most of the teachers a mere science of nomenclature, hardly rising to the dignity of true systematic study. This doubtless arises from two causes: first, because of want of means to enter upon other fields of work in the vegetable kingdom; and second, because the mass of students simply caught the enthusiasm of the great teachers whose energies were bent upon reducing to some respectable order the vegetable cohorts of the land, though the former for want of time were unable to reach the inspiration which was founded upon the deepest insight into the anatomy and physiology of plants. Even this measure of attainment is commendable and has at least led to the capacity for discovering what others have to say about any given plant, and so paved the way for the more thorough modes of these coming years. We are commencing to feel that even without a name a plant may teach us much that is worth knowing, to which knowledge it is all the better that we shall add the name as well.

How shall we teach botany then that it may meet modern wants, and associate itself properly with its biological ideas which are now doing so much to shape modern mental culture?

Our best appeal here is to the facts, and I believe I am safe in saying that the whole, or nearly the whole American impulse in botany owes its origin, directly or indirectly, to Cambridge. Certainly it has been a prolific teacher of teachers; so prolific that we may well ask its methods. These may be summed up in the one sentence: *The teacher will keep you on the track, but you must find out for yourself.*

The same fundamental idea characterizes the celebrated laboratories of Germany, and notably, the oldest and probably the most productive one, that of Prof. deBary. One essential difference obtains however between the American and German laboratories; we give

systematic, they anatomical and physiological botany greater attention. Herein I am persuaded they are correct. I believe I am safe in saying that a man might there successfully pass his examination for the degree of Doctor of Philosophy and yet not be able to name "on sight' three hundred species of plants; but he has the training which enables him to determine all, when there exists a necessity for doing so. We on the contrary insist on the recognition of plants, without inquiring too critically how much the candidate knows about them.

Systematic botany must, if it represents a strictly natural system, be founded on a nice appreciation of the entire organization, the life history of the individual, and its relation in present and past time to allied plants. This then is the highest, all embracing trend botanical thought can assume. In aspiring to this we neglect the foundation. The German school builds a solid foundation and leaves the student mainly to give the superstructure such shape as he will. Between the two there can be but little doubt as to which is the more philosophic, or certainly as to which is the better mode of training for original investigation.

The laboratories of Harvard, Michigan (two) and Iowa have taken the initiative in introducing needed reforms, and already a most promising crop of fruit is the result. The labors of Torrey, Gray, Engelmann and Watson have placed our phænogamic flora on firm foundation for subsequent workers, and the question now is how are these to be trained? First of all, by indoctrinating them with the idea that they will make the most substantial mental gains if they study each individual plant exhaustively. How far this shall be carried is a question for the judgment of the teacher, but it is the idea the student should be saturated with "through and through." It is the foundation of his foundation, and makes critical investigation press upon him with the weight of an ever present duty. Yet this is just the hardest lesson every American teacher finds it to inculcate. Does it indicate a radical defect in the earlier culture, or is it a race peculiarity?

Another idea in this connection is worthy the consideration of teachers, *i. e.*, that take any plant, its life history is but imperfectly known, and the student may be encouraged to believe that he can in it find something hitherto unknown, if he will but hunt for it. The readiest possible confirmation of the absolute truth of this statement is found in that noble series of works Mr. Darwin has given the world. So valuable have they been that hardly a branch of natural science has failed to acknowledge their influence. Yet how few plants have been treated upon by them! This is essentially the idea upon which de Bary's instruction is predicated, and witness the discoveries, among the commonest plants, that have followed his systematic questioning point by point the life history of each one.

Apart from this honest study of one very narrow field, the lectures of the professor are not to be regarded as points confirmed for the special benefit of the student to save labor on his part, but rather as outlines of the facts the student must verify. The value of such training, embracing as it does a survey of the large part of the field

cannot be overestimated. With us the teacher does the asserting in his own, or other authority, the pupil simply accepts, and that ends it until examination day. But what critical scholarship, what mature judgment, has been, or can be formed by such a process?

No botanical laboratory is worth the name which does not include in its outfit a good working compound microscope, along with chemicals for each student, and type specimens, and a modern set of standard botanical works of reference which should be freely used. No botanical course, consisting of lectures exclusively can rise to the dignity of being contemptible, if its object is to make botanists or to even give a certificate of botanical proficiency. There is no biological laboratory of England where students investigate more critically the teachings of the chair than in that of Prof Huxley, nor, on the other hand is there any one which is producing now and promises in the future to produce a greater impression on the thought of the age. I conclude then that the time has fairly come for a change in our modes of teaching, and until we do adopt the methods of work which are now so universally followed abroad, we may expect to see an annual exodus of our most aspiring students to foreign seats of learning. Instead of concealing how much we lack of the true standard, the friends of liberal, practical, botanical education can do no more effective work than by agitating the subject until the remedy is furnished. There is yet one more aspect in which we may view this question. Popular ideas connect botany only with *flowers*. It is proper for us to insist that it produces *fruit* as well, that no science is more intimately associated with our food, drink, raiment and medicine than this. The public mind should be informed that it takes cognizance of practical forestry, of the diseases of our cereal grains, and indicates what we are to do in these directions.

That the impression should have prevailed so long that botanical study brings nothing of utility with it is largely our own fault. It is just what we have made it. When we work these needed reforms and show the public that we are in earnest, we may expect to see our science properly represented in every college of the land, but not before.—J. T. ROTHROCK.

Some Additions to the North American Flora, by Dr. G. Engelmann.—ESCHSCHOLTZIA CALIFORNICA.—The different forms of this common and extremely variable plant deserve to be studied more carefully at their homes, where they are found in such untold abundance. It is quite possible, as indicated in the Flora of California, that the several species into which it had been divided, may be sustained by reliable characters. All the forms, however, are said to be annuals with colorless juice. Now, on the sandhills of the ocean, quite close to the well-known Cliff-house near San Francisco, I found last October a form with long perennial roots, ½ inch thick, abounding in orange-colored juice, and bearing several stems; leaves shorter than the internodes, often opposite, flowers 1 inch wide; torus broadly margined, capsule about 2 inches long, seeds reticulated. In most

respects it represents the typical form of *E. Californica*, but the perennial rootstock seems to distinguish it; annuals, to be sure, in mild climates not rarely last for several years, e. g. *Solanum nigrum* in southern California, but in these the stem becomes ligneous and no rootstock forms, the normal tap-root not losing its characters, even if it does become 3 or 4 years old. It is barely possible that *E. Californica* is one of those perennials which will flower as seedlings in the first years and that then the aridity of the climate in many instances kills it, root and all; but if so, why has this occasionally (?) perennial character not been observed before?

PORTULACA SUFFRUTESCENS, n. sp.—Erect, about a span high from a stout, branching and apparently perennial rootstock, ligneous at base; leaves terete, about 1 inch long, with sparingly hairy axils; flowers clustered at the end of the branches, large (7 to 10 lines wide), yellowish buff colored; petals obcordate or emarginate; stamens numerous; filaments, like the 5 or 6 stigmas, red; seeds dark, with metallic luster, tuberculate.

In western New Mexico, at the copper mines, *C. Wright*, 874, coll. 1851; *Coues* and *Palmer*, Fort Whipple, northern Arizona, 1865; found by myself 1880, on rocky banks in the Santa Rita Mountains, southern Arizona.

Very near *P. pilosa*, with which I had formerly united it; the seeds of both are similar, their tubercles, magnified 40–60 diameters, appear very prettily as overlapping excrescences with a toothed free edge; both have dark seeds, ours with a metallic luster, the others more dull. The number of stamens in different flowers was about 40; while in *P. pilosa* it is stated to be 15 to 25, but in cultivated specimens of the latter I have found as many as 50! The color and size of the flower, the larger leaves with sparing hair in the axils, and the stouter stems and perennial (?) rootstock distinguish it from its purple flowered annual relative.

ROSA SPITHAMEA, Watson, Fl. Cal., 2, 444.—In the deep shade of the Big Trees of Fresno county, Cal., where scarcely anything else grows. I found what I take to be a form of this pretty little species, blooming in September. I may designate it as

Var. SUBINERMIS: Stems a span high, glabrous or more or less glandular hispid, with a few scattered setaceous spines (none stipular) or spineless; stipules short and narrow with short narrow divaricate free points; leaflets mostly 5, thin, pale below, elliptical or nearly orbicular, obtuse, sharply serrate and glandular serrulate; rhachis glandular-pubescent and often spinulose, petiolule of terminal leaflet almost its own length; flowers single (1¼ to 1½ inches wide) rose colored; peduncle slightly glandular, calyx tube globose, naked, lobes entire.

The stems of the same season bear the flowers, as is the case in *R. foliolosa* of Texas; or is it in this instance an autumnal form? There may be characters enough, especially the absence of any stipular spines, to distinguish specifically this southern form from the northern type, but considering the great variability of roses it is thought best to keep them together for the present.

The western roses and, to some extent, all our roses are in some confusion and what my cursory visit to the Pacific coast may have done to clear them up is offered here.

ROSA NUTKANA, Presl, is common in Oregon and northward, but I have not met with it in California; it is characterized by very broad and stout stipular and cauline spines, which are particularly abundant on annual shoots, and by large single flowers and large globose or depressed fruit. *R. Durandii*, Crepin, from Oregon, appears to be a form of this species with glandular calyx tube, which in the species is glabrous.

ROSA PISIFORMIS, Gray, stands next to this and not to the following. Like it, it has well developed stipular spines, but they are slender and more terete; corymbs few flowered, fruit smaller; young shoots mostly densely covered with dark red brown slender spines and spiny bristles, by which the plant can be distinguished any time, even without flower or fruit. I found it from British Columbia down to the neighborhood of San Francisco and Monterey.

ROSA CALIFORNICA, Cham. & Schl., a bush often 4–5 feet high, along streams, bears its flowers in large compound corymbs; its annual shoots are glaucous, covered with stout straight or often curved or even hooked glaucous spines; form of fruit variable, oblong or globose, with a more or less distinct contracted neck.—Common about San Francisco, thence northward to the Klamath River and southward to Los Angeles and San Bernardino.

ROSA GYMNOCARPA, Nutt., in the rich woods of the Oregon Coast Ranges with stems 1½–2 inches thick and 8 feet high, otherwise mostly a slender bush; annual shoots densely covered with glaucous or gray bristly spines; distinguished from all other roses, I believe, by its naked fruit (globose or elongated, sometimes pointed at both ends), from which after flowering the *united* calyx lobes separate, bearing at their base the stamens.

CAMPANULA SCABRELLA, n. sp.—Several leafy stems from a stout rootstock, a few inches high, 1 to several-flowered, the whole plant canescently-scabrous with very short rough pubescence; lower tufted leaves spatulate, obtuse, attenuated below, stem leaves sessile, lanceolate, acutish; flowers erect, lance-linear lobes of calyx as long as tube; ovate-lanceolate lobes of corolla as long as its tube, scabrous outside; style shorter than corolla; capsule erect, oblong, 10-angled, opening near the upper edge.

On bleak rocky ridges of Scott Mountain, west of Mount Shasta, under scattered trees of *Pinus albicaulis* and *P. Balfouriana* with *Anemone Drummondii*, Wats.,* *Veronica alpina*, *Polygonum Davisiæ* and the charming *Epilobium obcordatum*, in August. The thick tap-root penetrates 3 to 5 inches between the fragments of rock; lower leaves 1

*Well distinguished from *A. multifida* not only by its larger fruit and long style, but also by the oval, not circular, outline of the more finely divided leaves, the terminal division of which is long stiped, not sessile.

inch long, the upper not much shorter; branches strictly erect, peduncles naked, flowers nearly ½ inch long.

Distinguished from the closely allied *C. uniflora* by the habit, the cane cence and the form of the capsule. Careful study of abundant materials proves that *C. uniflora* will have to comprise all the forms from Colorado and Utah which have been named *C. Langsdorffiana* or *C. Scheuchzeri*, among them the specimens of Parry and of Hall with denticulate calyx lobes and similar ones gathered by myself; they have erect elongated capsules tapering below, opening near the top; corolla divided nearly to the middle, often 1 inch wide; stems 3 to 4 or 8 to 10 inches high, 1 to 4 flowered. True *C. Scheuchzeri* (or *linifolia*) comes from Alaska; its corolla lobes are short, ⅓ or less of the tube, the short ovate capsule is nodding and opens at base. The confusion arose in great part from the carelessness of collectors, who are mostly satisfied with nice flowers and neglect the less conspicuous fruiting specimens. Among several dozen specimens from the Rocky Mountains and Alaska, gathered by different collectors, I find only few with the characteristic capsules, and these I collected myself. Fruit and seed are such important organs that they ought always to be hunted up, and of every plant; this necessity is well known in *Compositæ* and *Umbelliferæ* but it is true of all plants and ought to be well borne in mind by collectors. Such neglect is one of the causes why the species of *Vitis* and especially the *Cactaceæ* were not better understood long ago.

A Double Epigæa repens.—A good many years ago, I think in 1867, my brother, Prof. L. W. Bailey, of Fredericton, N. B., sent me a note which I read before the Boston Society of Natural History, on a double *Epigæa repens*, found near his home. To-day Miss Sarah L. Mann, of Central Falls, R. I., communicates a specimen, found, she writes, among some flowers from Massachusetts. The precise locality is not given. The nearly sessile umbel presents seven blossoms all of which show increase of parts. The calyx exhibits no aberration, but is succeeded by three perfectly gamopetalous corollas, each within the other as in the familiar cases of doubling in *Datura* and like plants. In the changes the stamens have entirely disappeared, or are perhaps represented only by certain aborted, hood-like appendages to one or more of the lobes of the inner whorl. The pistil appears to be normal. In some of the flowers there are rudimentary filaments. The real, as well as the pseudo-corollas are provided with the usual pubescence, and are normal as to color and fragrance. It would be interesting to know whether this plant maintains itself as a perennial form, as in the case cited by my brother. I will add that the rosettes are extremely pretty, though to a botanist's eyes teratological developments are always a little obtrusive.—W. WHITMAN BAILEY, *Brown University*.

Artemisia annua, L.—This thrifty weed which has for a number of years been cultivated for ornament under the name of

"Sweet Scented Fern" threatens to become more abundant than desirable. In some localities in the southern part of this state, in patches, it appears to be the principal growth. It delights in broken ground and rich, sandy soil, but its accommodative powers appear to be great. I have observed it growing, uncultivated, in the counties of Wabash, Lawrence, Edwards and White, and I am informed by good authority that in the counties farther south it is becoming quite common. It being an annual will probably prevent it from becoming a very serious injury or annoyance to agriculture.

As this species is not described in any of our text books I will give the following description and notes on it, based on those given in the old German work referred to in the article on *Chenopodium album* and *viride* (BOT. GAZ., Vol. VI, p. 225): From three to six feet high, branching, ends of the branches and branchlets drooping, outline of whole plant pyramidal, clusters of flowers roundish and pendant, peduncles one-fourth inch long. Leaves tripinnately dissected, ovate lanceolate in outline, two to six inches long; whole plant smooth or very minutely pubescent. The whole plant gives off a strong, but not unpleasant odor, which partakes of that of *Artemisia Absinthium* and camphor. Root annual and yellow. This species is a native of Siberia. According to J. G. Gmelin the inhabitants of Jenisea boil this annual Artemisia with their mead to give it a pleasant odor (flavor?). S. G. Gmelin also reports, in his "Voyage through Russia," that this species of Artemisia is used in the tanning of the well known *Saffian* leather (Turkish morocco). He further remarks that a coloring matter is obtained from this plant named *Tschagan*, four pounds of which will color twenty-five goat skins. In this dye the skins are steeped, by the addition of one pound of finely pulverized cochineal, some honey and salt, the red color is obtained. To produce the yellow *Saffian* leather, another dye, called *Kuk* is added; in this latter case however, the honey and salt are omitted.—J. SCHNECK, *Mt. Carmel, Ill.*

New Species of Fungi, by Chas. H. Peck.—UROMYCES PSORALEÆ.—Spots none or indistinct; sori epiphyllous, scattered or crowded, sometimes occupying the whole upper surface of the leaf, blackish-brown; spores elliptical, obovate or pyriform, obtuse, granular within, .0008–.0012 of an inch long, .0008–.0009 of an inch broad, the pedicel short, colorless.

Living leaves of *Psoralea lanceolata* Utah. August. *Jones.*

The lower surface of the leaves in the specimens before me is occupied by *Æcidium Psoraleæ* which is probably the hymeniferous form of this fungus.

UROMYCES ZYGADENI.—Spots pale or yellowish, sometimes confluent; *hymeniferous fungus* with the peridia amphigenous, short, scattered or crowded, the spores subglobose, orange, .0008–.00095 of an inch broad, with a thin hyaline epispore; *teleutosporous fungus* with the sori amphigenous, clustered, small, blackish-brown, sometimes intermingled with the Æcidium; sporesobovate or subpyriform,

obtuse .0011–.0013 of an inch long, .0008–.0009 of an inch broad, the pedicel shorter than the spore.

Living leaves of *Zygadenus paniculatus*. Utah. June. *Jones*.

Professor Jones observes that this fungus destroys the leaves it attacks.

ÆCIDIUM SARCOBATI.—Spots merely a thickened portion of the matrix; peridia elongated, cylindrical, crenate lacerate at the apex, orange colored; spores subglobose, .0008–.0009 of an inch in diameter.

Living leaves of *Sarcobatus vermiculatus*. Utah. June. *Jones*.

The bright orange-colored elongated peridia make this a showy species. The cells of the peridia are pentangular or occasionally hexangular and contain highly colored oil globules. The spores in the dried specimens are whitish, but they may have been more highly colored in the fresh state.

SYNCHYTRIUM JONESII.T—ubercles rather large, unequal, prominent or somewhat depressed, hypophyllous, reddish-brown, the epidermis at length rupturing irregularly; spores globose, smooth, reddish brown, .0003–.0004 of an inch in diameter.

Living leaves of *Zauschneria Californica*. Bingham, Utah. Also on leaves of *Vicia Americana* in company with *Æcidium porosum*. Near Ogden, Utah. July.

In the color of the spores this species does not strictly agree with the generic character, but in other respects it is so good a Synchytrium that I have thought it best to refer the fungus to that genus. The species is dedicated to its discoverer, *Prof. M. E. Jones*.

NOTE.—Since the publication, in THE BOTANICAL GAZETTE, Vol. IV, p. 170, of the description of *Bovista spinulosa*, I have received, from Dr. J. J. Brown of Wisconsin, a mature specimen which shows that the peridium ruptures in a stellate manner and that therefore the fungus should be referred to the genus Mycenastrum. The description needs the following revision:

MYCENASTRUM SPINULOSUM.—Peridium globose, sessile, two to four inches in diameter, thick, firm, whitish, becoming tinged above with yellow and brown and externally cracking into rather large areas, the whole brown when mature and stellately splitting from above into six or seven unequal spreading or reflexed rays; capillitium and spores in the mass dark-brown with a slight purplish tinge; flocci rather short, pale, usually branched, armed with scattered unequal aculei which are more numerous near the acuminate extremities; spores globose, colored, minutely warted, .0004–.0005 of an inch in diameter.

The species may be distinguished from *M. Chilense*, to which it is allied, by its paler and globose peridium and by its larger and globose spores.

I have also received from Mr. C. G. Pringle of Vermont, fresh specimens of the fungus described in Vol. V, p. 35, under the name *Peziza spongiosa*. These show by their texture that the fungus should be referred to the genus Bulgaria, with the following description:

BULGARIA SPONGIOSA.—Cups large, one inch or more broad, concave or infundibuliform, becoming nearly plane, thin, soft, subgelatinous, externally blackish, hymenium blackish-brown, often becoming porous when old; stem one-half to one inch long, slender, black, rugose or longitudinally wrinkled; asci cylindrical; spores uniseriate, globose, smooth, granular within and sometimes uninucleate, .0005 of an inch in diameter; paraphyses filiform, colored, circinate or uncinate-curved at the tips.

Buried sticks under fir trees.

The Evolution of the Cryptogams.—Upon this subject the latest writing is from the pens of MM. Saporta and Marion. In two numbers of *Nature* the work is reviewed by J. Starkie Gardner. A second volume is to follow dealing with the evolution of Phanerogams. Of course the group Cryptogams has long been recognized to be a purely artificial one, but not quite so meaningless as its old subdivisions. The origin of all animals and plants is protoplasm and when we find this in an amorphous condition and yet possessing the attributes of life we cannot be far wrong in thinking that such forms are most nearly like the primordial ones. In certain other organisms this protoplasm secretes about itself a wall and presently chlorophyll is differentiated and we have all the essentials of a vegetative life. Thus are we led from the *Protista* to *Protophytes* and particularly to the *Algæ*. *Fungi* and *Lichens* are considered as groups whose development has been arrested by a parasitic habit and to *Algæ* must we look for an explanation of the manner in which aquatic vegetation became terrestrial. The more highly organized forms have always retained their aquatic habit, and it is from the lower *Algæ* that terrestial forms have originated. The authors think that "some, with flat cellular fronds, such as *Ulva*, crept, as it is supposed, face to the ground and became ancestors of the *Hepaticæ*. Others, more confervoid, produced a thallus whose growth, necessarily apical, became complex by simple vegetative multiplication. Foliary appendicles were given off, and a sort of plantlet with rootlets, stem, and leaves, all strictly cellular, came into existence, capable, like the Mosses at the present day, of agamous reproduction. In the earliest stage of growth of the *Equisetaceæ*, of Ferns, and of *Ophioglosseæ*, we see a similar primordial cellular plant, called a Prothallus, develop from the spore, and resembling in every respect the lower *Algæ*."

The authors lay a great deal of stress upon the effect of the reproductive act upon the differentiation of primordial plants. Two widely different groups would be developed by "tardy" reproduction and by "precocious" reproduction. In low forms reproduction arrests nutritive life. Hence forms like the Mosses and *Hepaticæ* in which the reproduction is tardy, would have a long period of vegetative life in which to adapt themselves to new conditions. In fact some mosses seem very little dependent upon sexual reproduction but can propagate themselves rapidly by their radicles. The "fruit" of the moss is really a distinct plantlet which in an asexual way gives

rise to spores and these spores in turn produce new vegetative plants. This comparatively short phase in the life history of the moss which we call its fruit, or more properly "sporogone," becomes the principal part of the life of plants with precocious reproduction, such as Ferns, Equisetaceæ and Ophioglosseæ. In these cases the prothallus at once gives rise to male and female organs, and the resulting "sporogone" by its vigorous growth soon destroys all traces of the early sexual phase. This primitive thallus becomes more and more subordinated as we advance in the plant kingdom, becoming of less relative size and more and more transient. As we advance the sexes begin to be separated and the way in which this might have been accomplished is very ingeniously presented. First the spores themselves become sexual and we have microspores and macrospores and here the prothallus nearly disappears and with it "almost the last trace of the primordial cellular Alga." We would thus have both a male and a female prothallus.

At last in Phanerogams the microspore or pollen grain produces the "pollen tube" as the representative of a male prothallus; while the macrospore or embryo sac gives rise to the female prothallus, which we call "endosperm."

The whole subject is one of exceeding interest and importance and we now begin to know enough to know that our old ideas of the relations of plants hardly deserve even the epithet "crude" and that immense fields of investigation are opening before us the extent of which no man dares to measure.—J. M. C.

How Cross-Fertilization is Aided in Some Cruciferæ.—In some *Cruciferæ* the introrse anthers of the long stamens become extrorse before the pollen is shed. In the opening buds of *Brassica campestris* and *Cardamine paucisecta* the anthers of one pair of stamens —slightly surpassing the stigma—exactly face those of the opposite pair; but while the flower is expanding and before the pollen is discharged the anthers of each pair by quarter twists of the filaments—one to the right, the other to the left—are made to face in opposite directions, thus virtually becoming extrorse. Moreover, the anthers bend downward, making it still more difficult for any wind shaking to bring pollen in contact with the stigma. The anthers of the short stamens remain introrse since, the stigma being out of their reach, they can do no harm.—VOLNEY RATTAN, *San Francisco, Cal.*

Sarracenia purpurea, L.—On June 8th while collecting a few specimens of *Sarracenia purpurea*, L., I was surprised on drawing aside the petals to look at the stamens, to see the whole cavity formed by the petals and the peltate expansion of the style filled with flies as large as the common house-fly, all busy as could be eating the pollen, of which scarcely a grain could be seen. I counted fourteen flies in one flower. They were in no hurry to vacate the premises. There was a shower coming up at the time, but they were evidently there for food. Nearly every plant examined was filled in the same way.—JOSEPH JACKSON, JR., *Millbury, Mass.*

Carex aurea, Nutt.—I have specimens of *Carex aurea*, Nutt., found growing in the moist, sandy soil just back of the lake beach. They fruit very abundantly and many of the spikes are decompound which on examination proves to be due to the proliferation of secondary spikes from the lower perigynia. In most cases this is shown by a tumidity of the base of the peduncle but in others (when the spikelets are small) the mother perigynium is quite well developed and occasionally one perigynium is superposed upon another. An interesting theory of the mode of development of the spikes of *Carices* might be based upon these sports.—J. J. Davis, *Racine, Wis.*

Cypripedium candidum.—Dr. Gray says that this plant grows in bogs. *C. pubescens* and *spectabile* are found here in damp woods and I have searched in similar localities, for years, for *candidum*, without success. Yesterday I discovered a fine lot growing on the driest kind of a rocky hill.—E. W. Holway, *Decorah, Iowa.*

Development of Heat in Flowers of Phytelephas.—It has long been an admitted fact that many plants at their season of flowering exhibit appreciable elevations of temperature: Lamarck, rather more than a century ago, was, I believe, the first to notice the phenomenon. As the few books I have had the time or opportunity of thus far consulting contain no mention of the behavior of the Ivory Palm (*Phytelephas macrocarpa*), I now write to put briefly on record two or three observations respecting that plant. A fine example (female) was recently in flower in the House No. 1 at Kew. On April 20th, at 1 p. m., the temperature of this house was 68° Fahr.; the bulb of the thermometer, which had been suspended for some time near the plant in question, was placed in the center of the cream-colored inflorescence, and the mercury almost instantly rose to 92°, showing an increase in temperature of 24°. It is probably fair to assume that the normal temperature of a plant like the *Phytelephas* with such a large surface for evaporation, &c., is considerably lower than that of the surrounding air; in any case the actual increase in temperature is remarkable. The following day, at the same hour, the thermometer registered 72° degrees in the house, and, when placed in the same position in the center of the inflorescence, only rose to the same height as that reached the preceding day, viz. 92°. As the drawn-out end of the bulb prevented it from actually touching the convex ovaries, a small incision was made in one of these, and the thermometer then rose to 94°. Within the last week *Philodendron sagittifolium*, with its anthers nearly ready to dehisce, showed a rise from 69° to 81°, and *P. eximium*, at a time when by sun heat the house had risen to 82°, exhibited a further increase of 10°. *Carludovica Plumieri* rose from 73° to 90°, but this last was certainly not in good condition, for the long barren stamens had already changed from creamy-white to cinnamon color, and the spathe had commenced to decompose, although not three hours had elapsed since the flowers had opened.—George Nicholson, *in Trimen's Journal.*